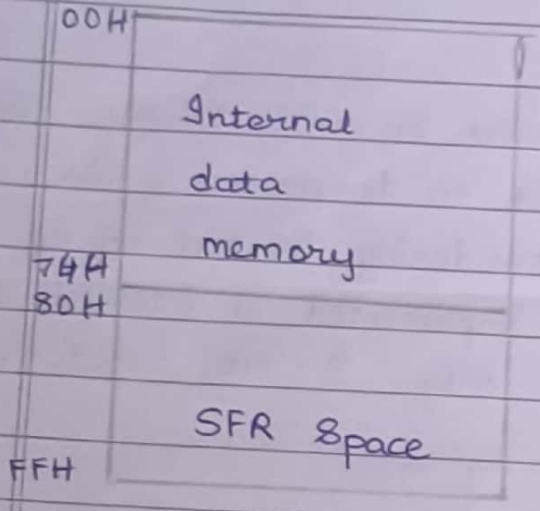
Roll No: B003
Batch: B-1

EIoT Assignment - 1

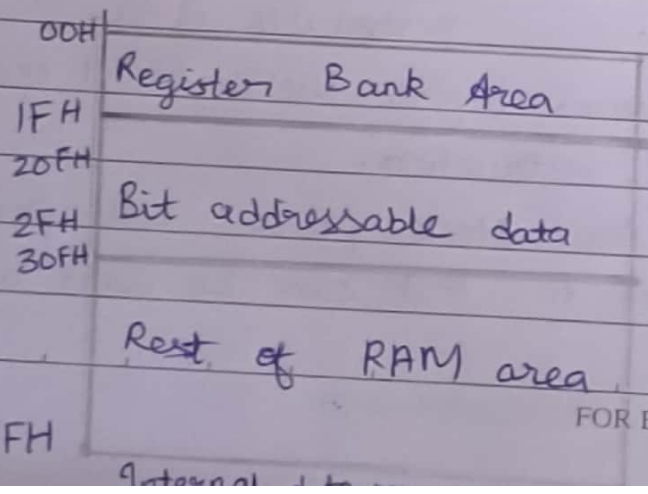
Q. 1 Explain memory organization in 8051.

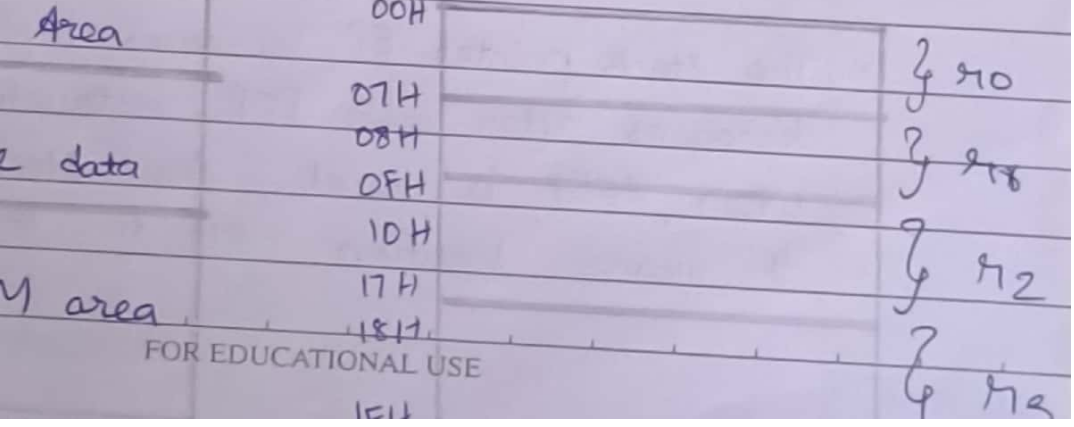
Ans The internal data of 8051 is divided into 2 groups. These are set of 8 registers and a scratch pad memory. The address range 00H to 07H is used to access the registers and rest are scratch pad memory. 8051 provides four register banks, but only 1 register bank can be used at any point of time.



SFR = Special Function Register.

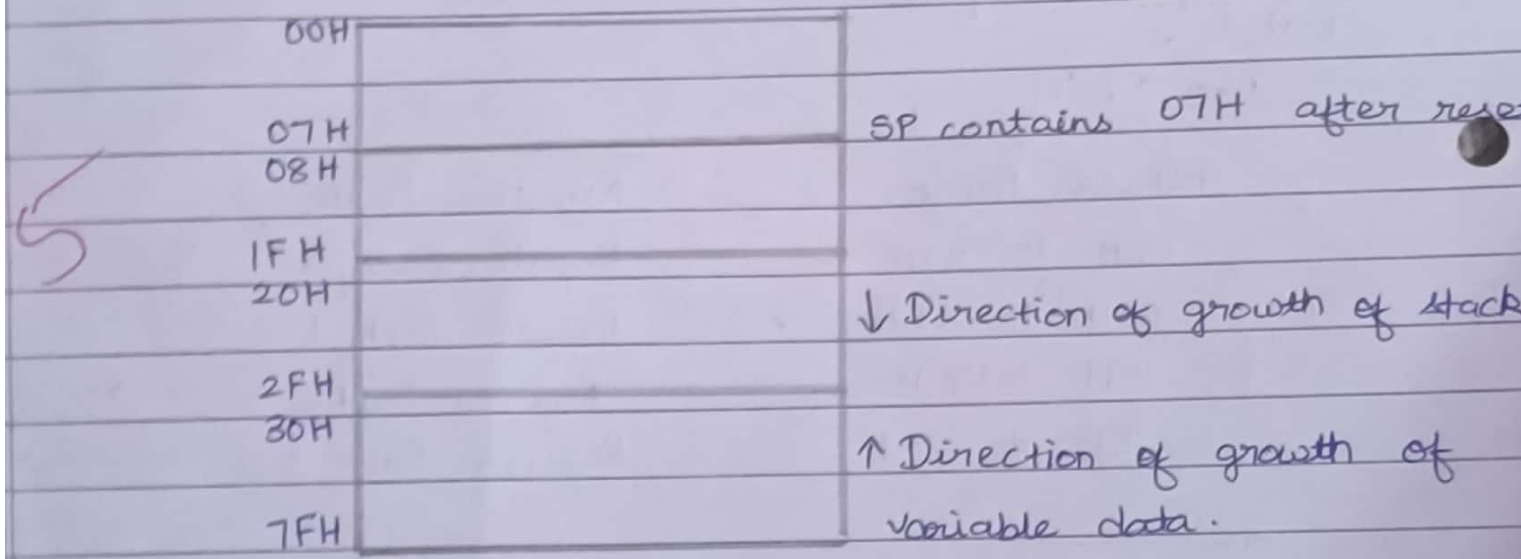
Address Range	Register Bank
00H to 07H	Register Bank 0
08H to 0FH	Register Bank 1
10H to 17H	Register Bank 2
18H to 1FH	Register Bank 3





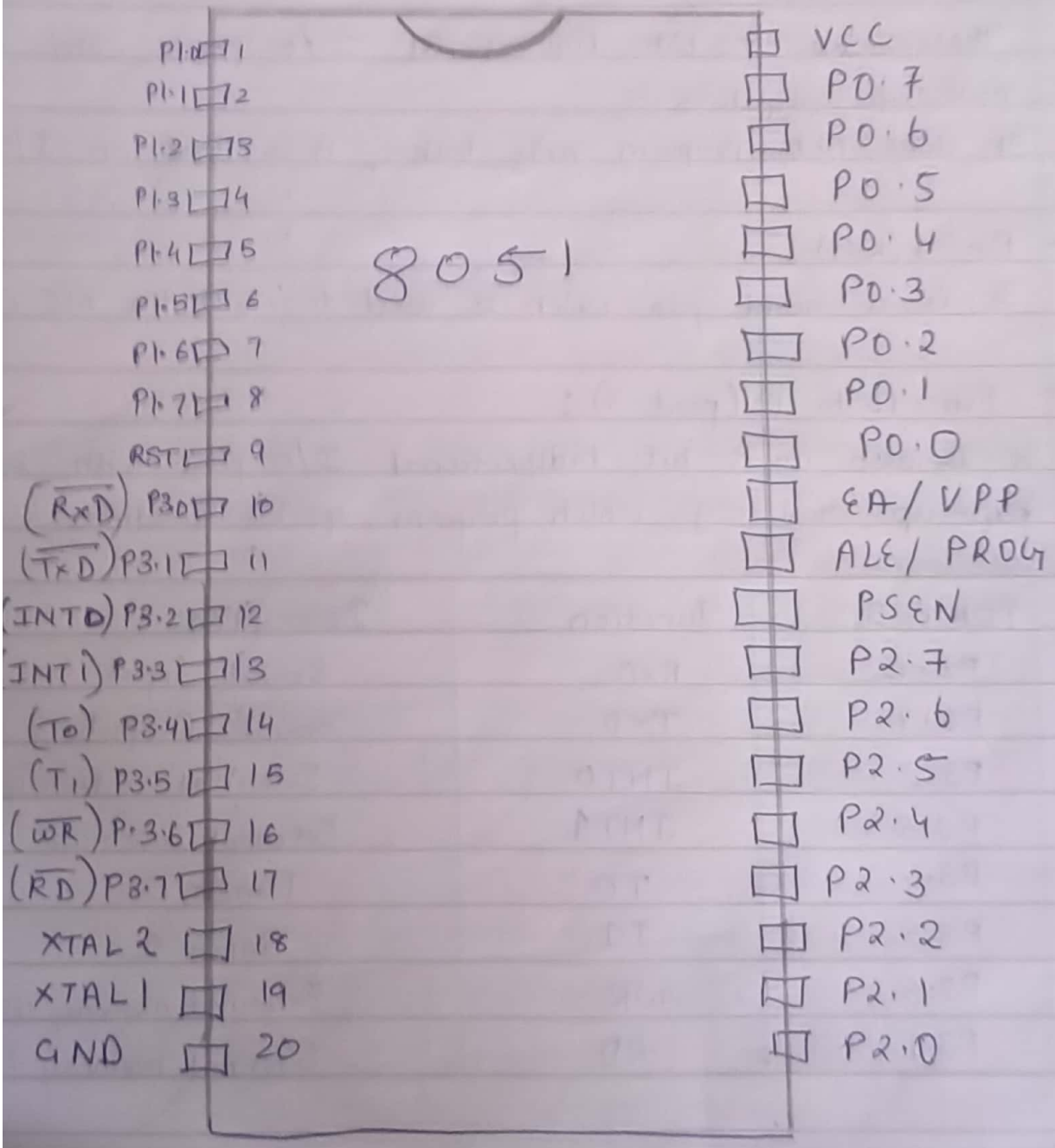
when all register banks are being used, the scratch pad area will be 20H to 7FH.
Bit from 20H to 2FH can be used as bit addressable RAM. By using simple instructions with 8-bit memory address we can check the bit addressing.
Another section of bit addressable locations is 80H to FFH.
The remaining locations of RAM can be used to store variable data and stack.

Stack Area
Stack is a section of RAM used by CPU to store information such as data or memory address on temporary basis.
CPU needs this storage area considering limited no. of registers. Stack area in 8051 is always implemented in internal data memory. Here, the stack pointer CSP is only 8-bit register.



The stack pointer SP increases before each PUSH operation and decreases after each POP instruction.
When 8051 is reset, the stack pointer will point to 07H. It means location 08H to 7FH can be used as a stack.

2 Draw and explain pin diagram of 8051.



The pin diagram of 8051 MC consists of 40 pins:

→ Pin 1-8 (Port 1)

- These are 8-bit bidirectional I/O port with internal pull up registers.
- It does not perform any task, it's just an I/o port.

→ Pin 9 (RST):

- It is a reset pin which is used to reset the MC.

→ Pin 10 to 17 (port 3):

- It is also an 8-bit bidirectional I/O port with internal pull-up resistory which perform special functions.

PORT 3	Function	Description
P3.0	RxD	Serial input
P3.1	TXD	Serial Output
P3.2	INT0	External interrupt 0
P3.3	INT1	External interrupt 1
P3.4	T0	Timer 0
P3.5	T1	Timer 1
P3.6	WR	External memory Write
P3.7	RD	External memory Read

→ Pin 18 and 19

- It is XTAL2 and XTAL1 pins. Used for connecting external crystal to get the system clock.

→ Pin 20 (GND)

- Connected to ground and is reference point Voltage for MC.

→ Pin 21 to 28 (PORT 2):

- These pins are bidirectional I/O port with higher order address but signals are multiplexed with bidirectional port.

→ Pin 30 (ALE / PROG):

- This pin is the address latch enable pin.
- It is input high active pin.
- This pin is used to distinguish b/w memory chips when there are multiple memory chips.

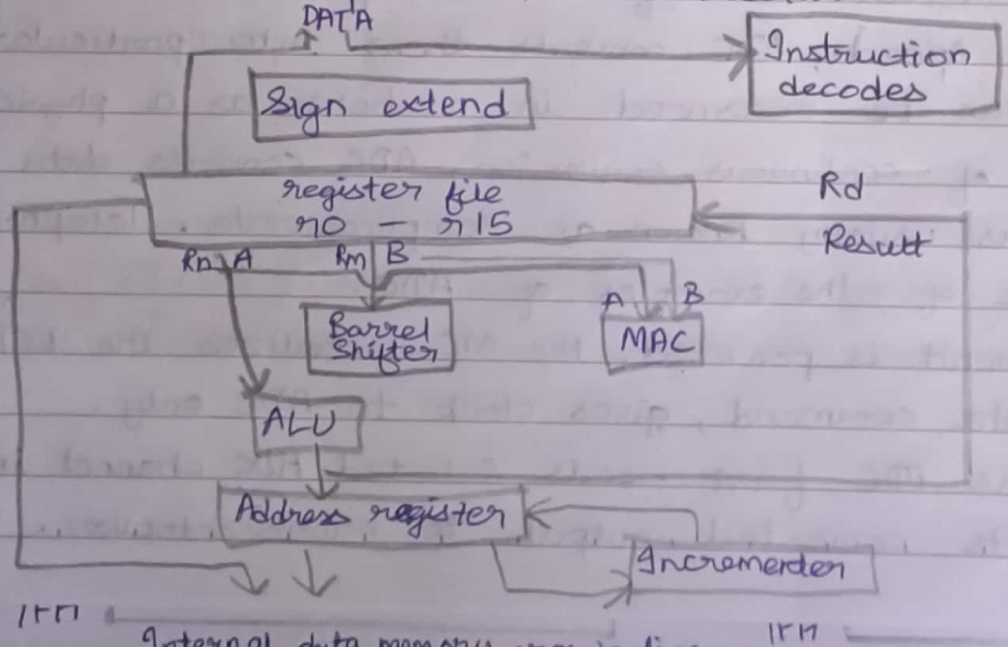
→ Pin 32 - 39 (PORT 0)

- These are also bidirectional I/O pins but without internal pull-up registers.
- It needs external pins to use port 0 pins as I/O port.

→ Pin 40 (VCC):

- This pin is used to supply +5V voltage power to the circuit.

Q. Draw and explain ARM architecture.



In ARM, core functional units connected by data buses, where arrows represent flow of data, lines represent the buses, and boxes represent either operation unit or storage area. The instruction decoder translates the instructions before they are executed.
It uses load-store architecture means it has 2 instructions type for transferring data in and out of processor.
Load instructions copy data from memory to registers in the core.
Store instructions copy data from registers to memory.
Data items are placed in a register file a storage bank made up of 32-bit register.
Source operands are read from register file using the internal buses A and B.

Explain the interfacing of ADC with microcontroller.
ADC is analog or digital converter which converts analog data into digital format, usually it is used to convert analog voltage into digital format.
Analog signal has infinite no. of values like a sine wave or our speech, ADC converts them into particular levels, which can be measured in numbers as a physical quantity. Instead of continuous conversion, ADC converts data periodically which is usually known as sampling rate. Telephone modem is one of the examples of ADC.
When circuit is powered, the MC initializes the LCD by using appropriate command, gives clock to ADC only.
After the ADC first reads selected ADC channel input and gives its converted output to microcontroller.

Explain the 7 layers of IoT.

Application Layer
User Experience
Session Layer
RF Layer
Hardware Interface Layer
Processing & controller layer
Sensor Layer

Layer 1:

This layer is concerned about the physical components which mainly includes sensors.

Temperature sensor, pressure sensor, humidity sensor, etc can be referred as physical layer components.

Layer 2:

Microcontrollers and Microprocessors are found in this layer. The data is received by microcontroller from the sensors. Operating systems play a major role too and Android, Linux can very well execute the task.

Data collected from sensors is processed in this layer.

Layer 3:

The hardware components and communication standards such as RS232, CAN, SPI, SCL, PC occupy this layer. All these layers ensure flawless communication.

④ Layer 4 :

- It plays a major role in communication channel - be it short range or long range.
- The protocols used for communication and transport of data based on IP are listed in this layer.

⑤ Layer 5 :

- Session layer is important in IoT as it is in general networking which is guided by OSI layer.
- There are protocols which oversee how message are broadcast in clou

⑥ Layer 6 :

- This layer is fully concerned with end user experience.
- When a product is designed, it should showcase rich UI features and designs which provide a pleasing experienc while using the service / system.

⑦ Layer 7 :

- Everything comes to perception at this layer.
- This layer talks about possible applications that can be built with support of rest of the layer.
- It can range from a simple automation to smart city application.